OpenCV

OpenCV which stands for Open Source Computer Vision Library developed by intel formerly in 1999 to improve the CPU intensive computer vision applications. In the year 2000 Intel released OpenCV as an Open Source freely available for anyone to use. OpenCV had played a key role in most of the computer vision related tasks of the Modern Era, from facial recognition to Auto pilot Cars OpenCV plays an important role in peoples lives.

a)What OpenCV is and how it is used in robots for vision:

OpenCV is a Computer Vision Library which aids in the computer vision intensive tasks which are carried out by accessing image or the camera. A robot without OpenCV is a hardcoded static entity with no variety in its application. This may work just fine in assembly robots but for more intelligent robots real time data is a need more than just a want. The robots can act dynamically on the real time data through cameras along with whatever sensors it may have. This vastly improves the spectrum in which the robot can act.

b)Basic image processing tasks:

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To a Computer and image is a matrix of various 3 x 1 matrices each element of the containing a value from 0 to 255(0 signalling black and 255 signalling white) which denotes pixel intensity, in the order of BGR rather than the conventional RGB format. OpenCv computes this information for object recognition,etc.

c) Explore Computer Vision Concepts:

Computer vision is a component of artificial intelligence that enables computers to interpret visual information from images and videos. It involves converting images into numerical data and utilizing methods such as image processing, feature extraction, and pattern recognition to identify objects, shapes, colors, and movements. Some key concepts include edge detection, segmentation, and object detection. These concepts enable machines to recognize important visual details in their environment. Today, many computer vision systems use deep learning models to achieve high accuracy in tasks such as face recognition and self-driving navigation.

YOLO

YOLO which stands for You Only Look Once is an algorithm specifically designed for objected detection which was a huge turning point in computer vision tasks and had made object detection faster and more reliable. Its fast and simple nature paired with its blitzerring speeds along with end-to-end trainability is simply unmatched. This speed paired along with accuracy balance made YOLO especially suitable for tasks like autonomous driving, surveillance, robotics, and smart cameras.

a) What YOLO does (object detection):

YOLO (You Only Look Once) can identify objects in an image or video and locate them at the same time. Instead of just detecting the presence of an object, YOLO also signails where each object is. Its passes the input frame through a neural network which identifies many objects and encages them in boxes with labels as per it is trained.

b)Difference between detection and classification:

- Object Detection:
  Object Detection is identifies the objects shown in the image or frame and encasing them around in boxes to signify their presence.
- Image Classification:
  Image Classification does the same as Object Detection but better as it also labels the Object based on the data it had been trained on.